SHORT TERM ANALYSIS OF PRIMARY CEMENTED HEMIARTHROPLASTY FOR UNSTABLE TROCHANTERIC FRACTURES IN ELDERLY PATIENTS

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CHENNAI

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CERTIFICATE

*This is to certify that this dissertation entitled "***SHORT TERM ANALYSIS OF PRIMARY CEMENTED HEMI ARTHROPLASTY FOR UNSTABLE TROCHANTERIC FRACTURES IN ELDERLY***" is the bonafide work done by* **Dr.K.KARTHIK**, *under my direct guidance and supervision in the Department of Orthopaedic Surgery, Madras Medical College, Chennai-3 during his period of study from May 2004 - March 2007.*

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CONTENTS

INTRODUCTION

INTRODUCTION

Hip fractures most often affect the elderly and have a tremendous impact on both the health care system and society in general. In human beings any affection of the hips is of much concern since it offers locomotion. From the very beginning most of the proximal femur fractures in the elderly were associated with considerable co morbidity.

The intertrochanteric fractures occur in the more elderly age group than femoral neck fractures. Most inter trochanteric hip fractures can be treated successfully with internal fixation. Failure rates as high as 56% have been noted in certain problematic fracture patterns - Haidukewych et al . The failure after internal fixation had been due to initial fracture pattern, communition, sub optimal fracture fixation and poor bone quality. The failed treatment of hip fractures typically leads to profound functional disability and pain.

In these patients treatment with primary cemented hemiarthroplasty could perhaps return the patients to their pre injury level of activity more quickly, thus obviating the post operative complications caused by immobilization or failure of the implant.

The purpose of the present study was to evaluate the results, technical problems with cemented hemi arthroplasty for communited, osteoporotic trochanteric fractures of the elderly.

AIM OF THE STUDY

AIM

The aim of this prospective study is to analyse the short term follow up results of primary cemented hemi arthroplasty in unstable trochanteric fractures of the elderly done in our institution from May 2003 to April 2006.

REVIEW OF LITERATURE

HISTORICAL REVIEW

Ashley Cooper recognized fractures in the proximal femur distal to the insertion of capsule. He noted that they invariably united without difficulty often with external rotation and shortening leading to coxa vara. Till the 1940s the standard treatment was reduction of the fracture and immobilization in plaster spica or in traction. The long period of immobility required for this treatment carried considerable morbidity, particularly in elderly patients. In addition to problems of prolonged bed rest, reports about various management strategies were not satisfactory

The justification for early rehabilitation in this group was accurately summed up by this quotation by Evans. ‘‘*The very old patients who sustain this injury tolerate pain and immobility badly; their mental state is often precarious and is quick to develop bed sores or pulmonary complications. We believe that they should be treated as surgical emergency and the older and more feebler the patient the more urgent is the need for the operation*”

Evolution of treatment:

1878-Langeneck and Koenigs first performed open reduction and internal fixation using a nail for fixation of the hip fractures.

1881-Senn was the first to publish an account on the use of a screw for internal fixation.

1900-David used ordinary wood screw.

1925-Smith Petersen reported an account on use of triflanged nailing.

1932-Johannsenn introduced a cannulated triflanged nail.

1937-Thornton devised plate attachment for the triflanged nail.

1941-Jewett pioneered a one-piece implant by adding a solid plate to the triflanged cannulated nail.

1944-Austin and Moore introduced a blade and plate, also advocated the use Multiple pins which prevented rotations and supported the proximal fragment in all quadrants.

1947-Mc Laughlin designed a variable angled nail plate which was string and did not require bending of the plate to change the angle while attaching to the smith peterson nail.

1955-Schumpelick and Jantzan described a sliding screw, the design of which they attributed to Ernest Pohl.

1964-Clawson reported the use of a sliding screw and plate. The device was manufactured independently by Richard’s manufacturing co.

1967-Zickel described a new Y shaped device which combined an intramedullary nail with a triflanged nail and was passed into neck and head.

1974-Tronzo reported satisfactory results using a Matchett – Brown endoprosthesis in the primary treatment of unstable intertrochanteric fractures.

1977 – Stern and Goldstein reported use of Lein bach prosthesis in the primary treatment of unstable intertrochanteric fractures.

1978 - Ender described a closed method of passing flexing nails retrograde in to the neck.

1980 - Harris described closed condylocephalic nailing.

1981 – Pho RWH reported the use of Thomson prosthesis in the primary treatment of unstable intertrochanteric fractures of the elderly

1987 – Green S, reported satisfactory results with Bipolar prosthetic replacement for treatment of unstable intertrochanteric fractures of the elderly

1990 – Harwin SF, reported satisfactory results with Leinbach Bipolar prosthetic replacement for treatment of unstable intertrochanteric fractures of the elderly.

2000 - Chan, K. Casey MD; reported the use of Cemented hemiarthroplasties for elderly patients with intertrochanteric fractures;

2003 - Haidukewych GJ, reported Hip arthroplasty for salvage of failed treatment of intertrochanteric hip fractures.

2004 – James P. Waddel, reported the role of total hip replacement for treatment of unstable intertrochanteric fractures.

2005 - Shin Yoon Kim MD, reported Cementless calcar replacement hemiarthroplasty compared with intramedullary fixation of unstable intertrochanteric fractures.

2005 - Grimmsrud C, reported on Cemented hip arthroplasty with a novel circlage cable technique for unstable intertrochanteric hip fractures.

ANATOMY

The proximal femur includes the head, neck, lesser and greater trochanters, and proximal femoral diaphysis. Although extremely variable, the adult neck-shaft angle averages 125 degrees (range, 106 to 155 degrees). Usually, the femoral head center lies one diameter medial to, and level with, the tip of the greater trochanter.

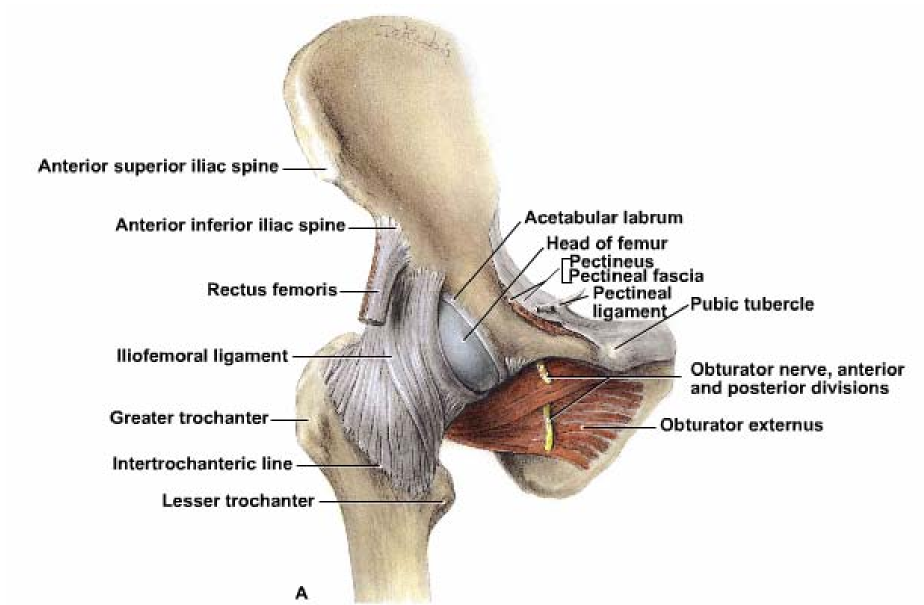
The external geometry of the proximal femur is dominated by the presence of the greater trochanter, which provides an extensive area for musculotendinous insertion. The infralateral trochanteric ridge reliably defines the origin of the vastus lateralis muscle. The lesser trochanter lies posteromedially and provides for insertion of the iliopsaoas tendon. The calcar femorale is a dense vertical plate of bone arising from the posterior & medial femoral shaft beneath the lesser trochanter and extending laterally towards the greater trochanter.

The Classic intertrochanteric fracture of femur occurs in a line between greater trochanter and lesser trochanter.

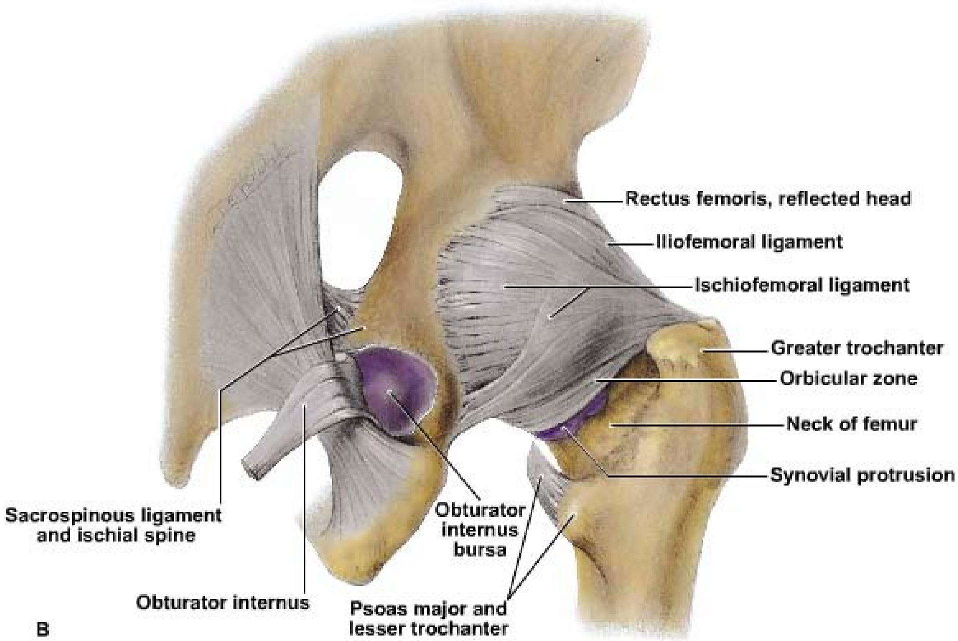
Greater trochanter provides attachment for most of the gluteal muscles. Gluteus minimus is inserted into the rough impression on the anterior surface of greater trochanter. Gluteus medius is inserted into the oblique flattened strip which runs downwards and forwards across the lateral surface of the greater trochanter. At its point of insertion the gluteus medius is covered on its lateral surface by gluteus maximus. There is a bursa between the greater trochanter and the gluteus maximus. Upper border of the trochanter gives insertion to piriformis and its medial surface to common tendon of obturator internus and gemelli.

The lesser trochanter has the attachment of psoas major at its tip and medial part of the anterior surface. Iliacus is attached to the medial or anterior surface of its base and extending behind spiral line.

HIP JOINT ANATOMY



Anterior aspect



Posterior aspect

MUSCLES PRODUCING THE MOVEMENTS:

Flexion

Psoas major and iliacus assisted by pectineus, rectus femoris and sartorius.

Extension

Gluteus maximus and hamstring muscles.

Adduction

Adductors longus, brevis and magnus assisted by pectineus and gracilis.

Abduction

Glutei medius and minimus assisted by tensor fasciae latae and sartorius.

Medial Rotation

Tensor faciae latae and anterior fibers of glutei medius and minimus.

Lateral Rotation

Obturator muscles, gamelli and quadratus femoris assisted by piriformis, gluteus maximus and sartorius.

BIOMECHANICS

Biomechanics Of The Normal And Replaced Hip Joint:

Bone is a living tissue it changes its shape and structural properties according to the load. The implant materials react biologically with the body in a way that can cause considerable damage if care in their selection is not taken.

It is necessary to determine, by experiment or calculation, the forces acting on the normal hip structure - due primarily to the external loads and the muscle forces acting at the hip joint. Knowing the forces, the stresses can be calculated and this information used in the design process to try to ensure that the replacement joint components can withstand the stresses without failing.

There are two ways of estimating these stresses. The more traditional method is to measure them, usually by fixing strain gauges at important locations on the bone, which is then loaded. The stress is calculated from the strain, knowing Young’s modulus for the strain gauge material.

Experimental work has, on the whole, been replaced by computational methods using Finite Element Analysis. This technique involves creating two dimensional or three dimensional models of the structure made up of small elements applying joint and muscle loads to the model and letting the computer calculates the stresses.

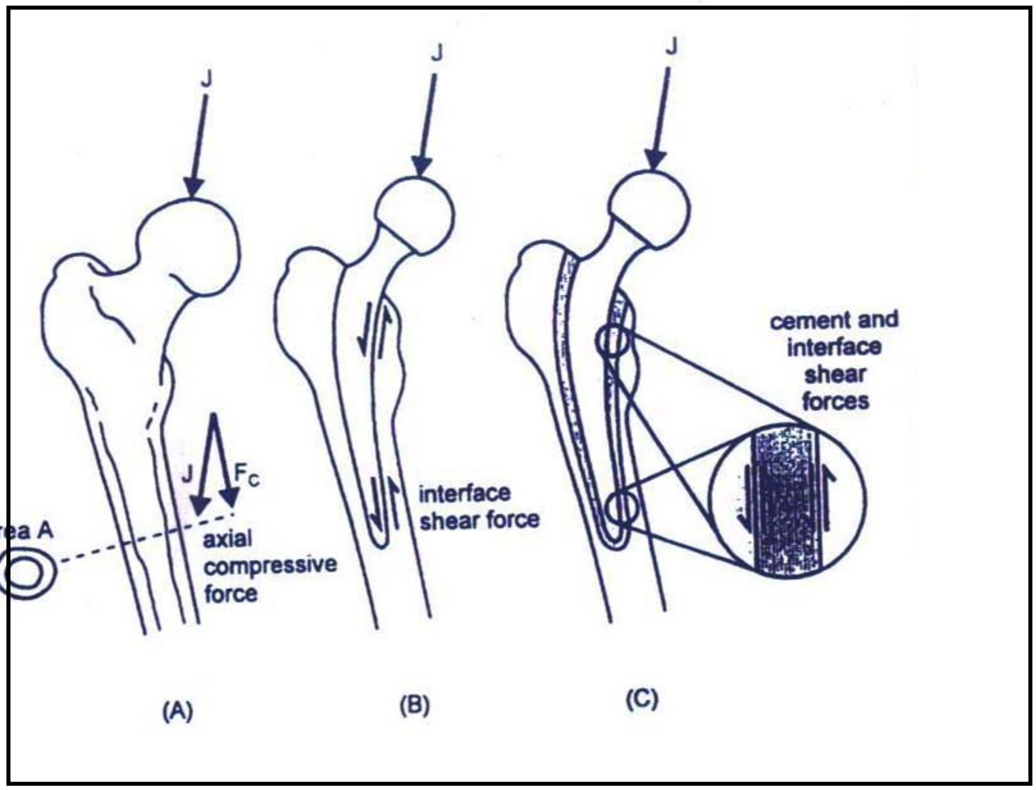
The load transfer mechanisms in normal and replacement hips are quite different. The stresses generated in both structures will be discussed for axial, bending and torsional loads in the femur and femoral stem and for compressive loads in the acetabulum. In practice, all methods of calculating stresses are only estimate because the material properties of bone and the bone - implant interface properties are variable and cannot be determined accurately.

FORCES ACTING ON THE HIP

The body weight can be depicted as a load applied to a lever arm extending from the body’s center of gravity to the center of the femoral head.

The abductor musculature, acting on a lever arm extending from the lateral aspect of the greater trochanter to the center of the femoral head, must exert an equal moment to hold the pelvis level when in a onelegged stance, and a greater moment to tilt the pelvis to the same side when walking or running. Since the ratio of the length of the lever arm of the body weight to that of the abductor musculature is about 2.5:1.

When lifting, running, or jumping, the load may be equivalent to 10 times the body weight. Therefore excess body weight and increased



SHEAR FORCES AT BONE-STEM AND BONE-CEMENT-STEM INTERFACE

physical activity add significantly to the forces that act to loosen, bend, or break the stem of a femoral component.

The forces on the joint act not only in the coronal plane, but because the body’s center of gravity (in the midline anterior to the second sacral vertebral body) is posterior to the axis of the joint, they also act in the sagittal plane to bend the stem posteriorly. Such forces cause posterior deflection or retroversion of the femoral component.

Rotational stability of the stem can be increased both proximally and distally. Increasing the width of the proximal portion of the stem to better fill the metaphysis increases the torsional stability of the femoral component.

Modifications of the distal portion of the stem may add to rotational stability as well. Longitudinal cutting flutes and extensive porous coatings that “scratch” the diaphyseal endosteum improve rotational stability in the absence of cement.

COMPRESSIVE STRESSES IN THE FEMUR

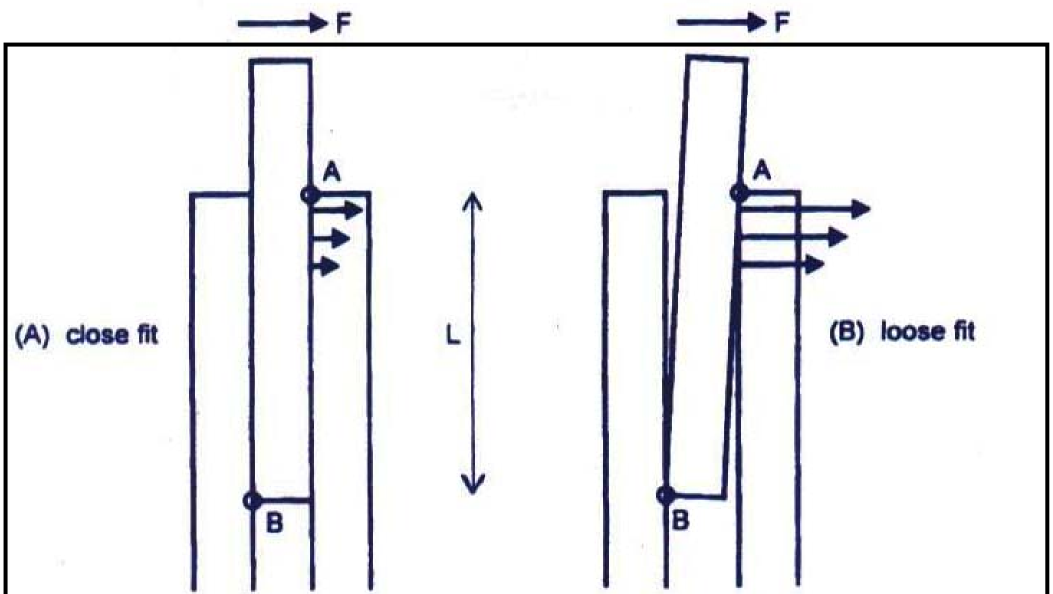
The highest moments occur in the coronal plane. However, there are also moments acting in the sagittal and transverse planes. The compressive joint force is transferred from the stem to the femur as a shear force, passing directly from the stem to the bone in a cementless prosthesis, or via the cement layer in cemented prosthesis, causing shear stresses in the cement. If the stem-bone bond or stem-cement-bone bond is not sufficiently strong, the prosthesis will loosen and sink down the medullary cavity. The compressive stresses in the stem itself can be found by dividing the compressive load taken by the stem at any section along its length by the area of that cross section.

BENDING STRESSES IN THE FEMUR

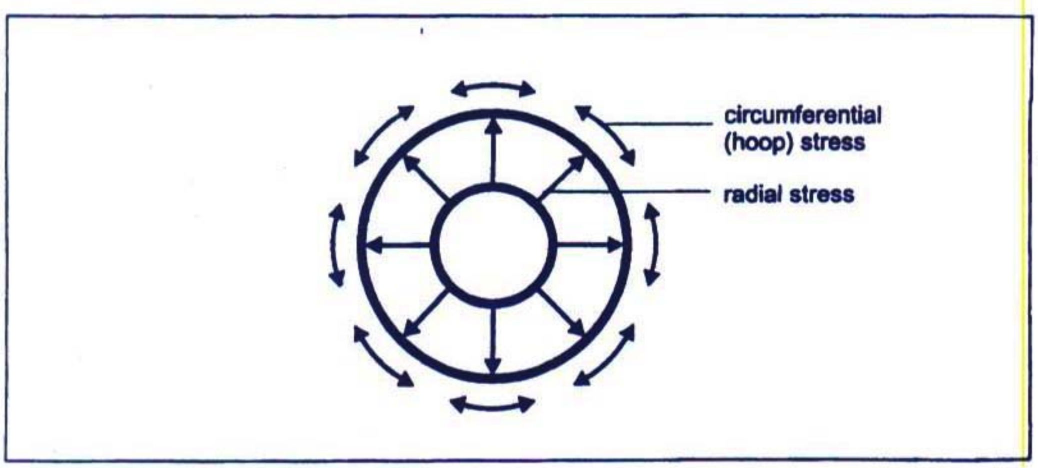
The joint force acting on the normal hip produces not only a compressive stress but also a bending stress in the femur. The bending stress is caused because the direction of the joint force vector is not along the neutral axis so the femur provides one main contact point and the lateral distal side provides another, which counteracts the tendency for the stem to rotate due to the bending action of the joint force. The main likelihood of stem failure is if it loosens proximally in which cases the bending moment at the distal end increase drastically and failure can occur.

HOOP STRESSES DUE TO BENDING

Radial and circumferential (hoop) stresses are also generated under the action of a bending load. Radial stresses (stresses that are directed radially outward from a central point) are greatest at the points of bone - stem contact at the proximal and distal ends and are less in between.



HIGH STRESS CONCENTRATION DUE TO A LOOSE FITTING STEM



DIRECTION OF RADIAL AND TENSILE HOOP STRESSESS
IN A HOLLOW CIRCULAR STRUCTURE

proportional to the square of the length of contact, l of the stem with these radial stresses in turn cause hoop stresses in the bone which are primarily tensile stresses that act in a direction that tends to split the bone. These stresses cause tensile hoop stresses around the circumference. In figure the stem has a loose fit in the bone giving rise to very high local stresses a and b, causing hoop stresses that are high enough to fracture the bone. It has been shown that the radial stresses are inversely the bone. This means that stems of short length are prone to cause high radial stresses on the bone.

STRESSES IN THE ACETABULUM

The acetabulum is subjected to a compressive load, the joint force, which manifests as a compressive stress. The normal acetabulum has a slightly larger diameter than the head of the femur, which has an approximately spherical surface. From a structural point of view, it can be considered to be a sandwich of cancellous bone between two layers of cortical bone - one covered with articular cartilage forming the joint bearing surface. This structural sandwich forms a lightweight structure with good rigidity under a bending load. Under the compressive joint loading caused by the femoral head pressing into the acetabulum, the cortical shells are highly stressed and broken, which means that the cancellous bone, which is normally not highly stressed, has to take the load passed to it from the prosthesis

CLASSIFICATION AND ASSESSMENT

There are many classifications to assess and understand the intertrochanteric fractures of femur. These are put forth for better preoperative planning of treatment and to prognosticate.

BOYD H.P. AND GRIFFIN L.L.

This includes all fractures from the extra-capsular neck to a point, 5cm distal to lesser trochanter.

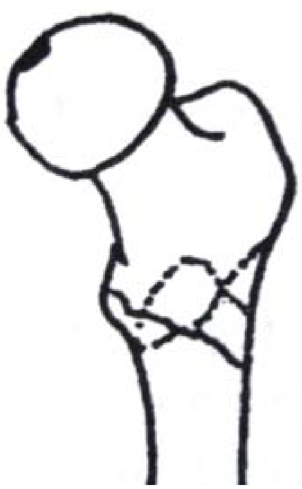
Type 1 :

Fracture extending along the intertrochanteric line from greater trochanter to lesser trochanter. Reduction of this type of fracture is usually simple and is maintained with little difficulty. Results are generally satisfactory.

Type 2

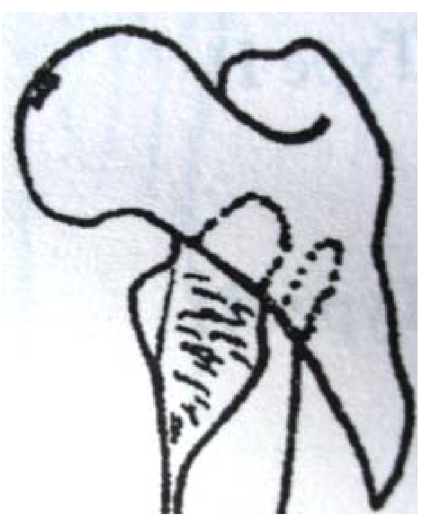
Comminuted fractures, the main fracture being along intertrochanteric line but with the multiple fractures in the cortex, Reduction of these fractures is more difficult as the communication may vary from slight to extreme.

Type 3



Fractures that are basically subtrochanteric with at least one fracture line passing across the proximal fragment (i.e.) the part including greater trochanter and lesser trochanter. Varying degrees of communition associated. These fractures usually are most difficult to reduce and result in more complications both at operation and during convalescence.

Type 4



Fractures of the trochanteric region and the proximal shaft, with fractures in at least two planes. During open reduction and internal fixation two-plane fixation is required because of the spiral oblique butterfly fragment on the shaft.

JENSEN AND MICHALSEN CLASSIFICATION

STABLE

Type 1	Undisplaced – 2-part fracture.
Type 2	Displaced – 2-part fracture.

UNSTABLE

Type 3	Three part where greater trochanter is 3rd part, loss of medial support.
Type 4	Three part fracture where lesser trochanter is the 3rd part, loss of medial support.
Type 5	Four part fracture involves both lesser and greater trochanter loss of medial and posterolateral support.

EVAN'S CLASSIFICATION

Evan's devised a simple classification system. He divided the fractures into stable and unstable types. Unstable types are further divided into those in which stability could be restored by anatomical or near anatomical reduction and those in which stability could not be restored.

Type 1 The fracture line extends upward and outward from the lesser trochanter.

STABLE

Group I Fracture in which inner cortical buttress has been undisturbed (65%).

- No displacement.
- Fractures become stable.

Group II Fracture in which there in simple overlapping of inner cortical buttress (7%).

- Can be reduced by manipulation.
- Fracture become stable.

UNSTABLE

Group III This group includes those fractures in which the overlapping remains unreduced (14%).

- Cannot be reduced by manipulation.
- Unstable fracture.
- Coxavara to be expected.

Group IV This group includes comminuted fractures (6%).

- Cannot be reduced.
- Unstable fracture.
- Coxavara to be expected.

Type 2 The of the major fracture line is reversed, in which fracture line extends outwards and downwards from the lesser trochanter. They have a tendency towards medial displacement of the femoral shaft because of adductor muscles 8%.

- Unstable fractures

TRONZO'S CLASSIFICATION (1973)

Tronzo classified the trochanteric fractures into 5 types.

Type I	Incomplete trochanteric fractures-Anatomical reduction is achieved with traction.
Type II	Non comminuted fractures with or without displacement in which both trochanter are fractured. They are reduced with traction. Anatomic reduction is usually achieved.
Type III	Comminuted fractures in which lesser trochanter fragment is larger. The posterior wall is exploded, beak of inferior neck already displaced into medullary canal of the shaft fragment. These are so called unstable fractures. A variant of type III is also fracture and separation of greater trochanter.
Type IV	Comminuted trochanteric fractures with disengagement of two main fragments. Again these are unstable with posterior wall exploded with the spike of the neck fragments displaced outside of or medial to the shaft.

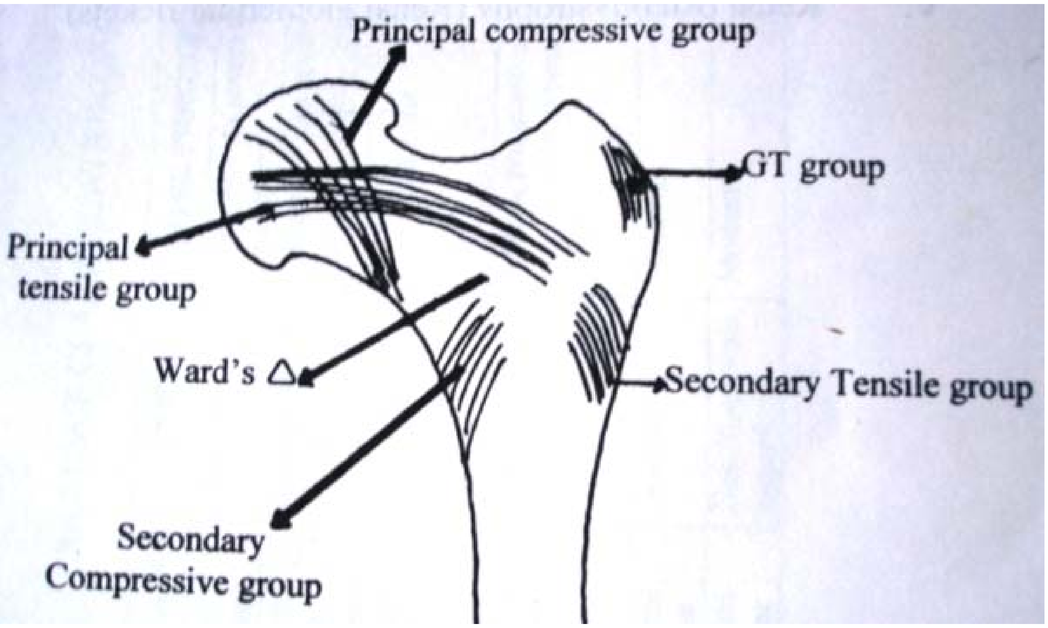
Type V	Trochanteric fractures with reverse obliquity. These are unstable.

KYLE, GUSTILO AND PREMIER CLASSIFICATION

Type 1	Fractures are stable, undisplaced intertrochanteric fracture.
Type 2	Fractures are stable, displaced fractures with fracture lesser trochanter and a varus deformity.
Type 3	Fractures involve fracture of greater trochanter, posteromedial communition and varus deformity.
Type 4	In addition to components of type III also have subtrochanteric component.

SINGH'S INDEX FOR ASSESSMENT OF OSTEOPOROSIS

Singh's Index is a method of grading the severity of osteoporosis and is estimated by studying the trabeculae within the proximal femur.



Grade 1 Even the principle compressive trabeculae with in the head are reduced. Other trabeculae are absent.

Grade 2 Most trabeculae reduced, other than those within the femoral head.

Grade 3 There is break in the continuity of the principle trabeculae opposite to the greater trochanter.

Grade 4 Principle tensile trabeculae are markedly reduced but can still be traced from the lateral cortex to the upper part of the femoral neck.

Grade 5 All trabeculae present but are less prominent and a triangle of radiolucency is apparent.

Grade 6 All the normal trabecular groups are visible and the upper end of the femur seem to be completely occupied by cancellous bone.

Grade 3 to 1 represent osteoporosis.

COMPLICATIONS

EARLY:

1. Intra operative cardiac problems due to cementation.
2. Fat embolism
3. Superficial hematoma
4. Pulmonary embolism
5. Respiratory distress
6. Infection
7. Shortening
8. Component malpositioning

LATE:

1. Dislocation
2. Deep infection
3. Painful non union of greater trochanter
4. Delayed fracture of greater trochanter
5. Peri prosthetic fracture
6. Shortening – due to sinkage of prosthesis in severely osteoporotic patients.

MATERIALS AND METHOD

MATERIALS AND METHODS

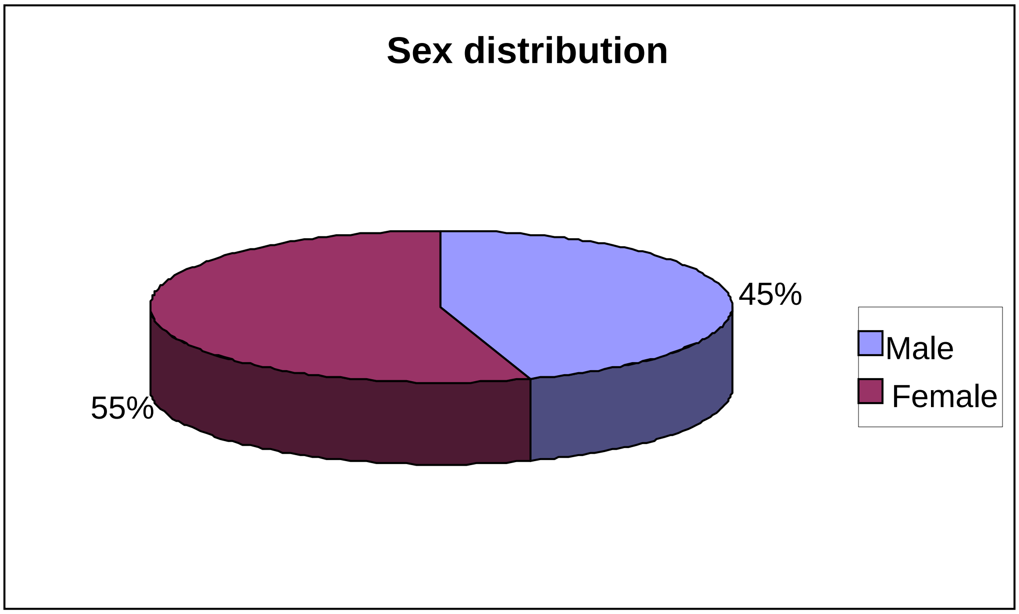
This study was conducted at Madras Medical College and Government General Hospital on 20 elderly osteoporotic patients with unstable inter trochanteric fractures from January 2004 to April 2006. All the patients were treated with cemented Thompson or Bipolar prosthesis.

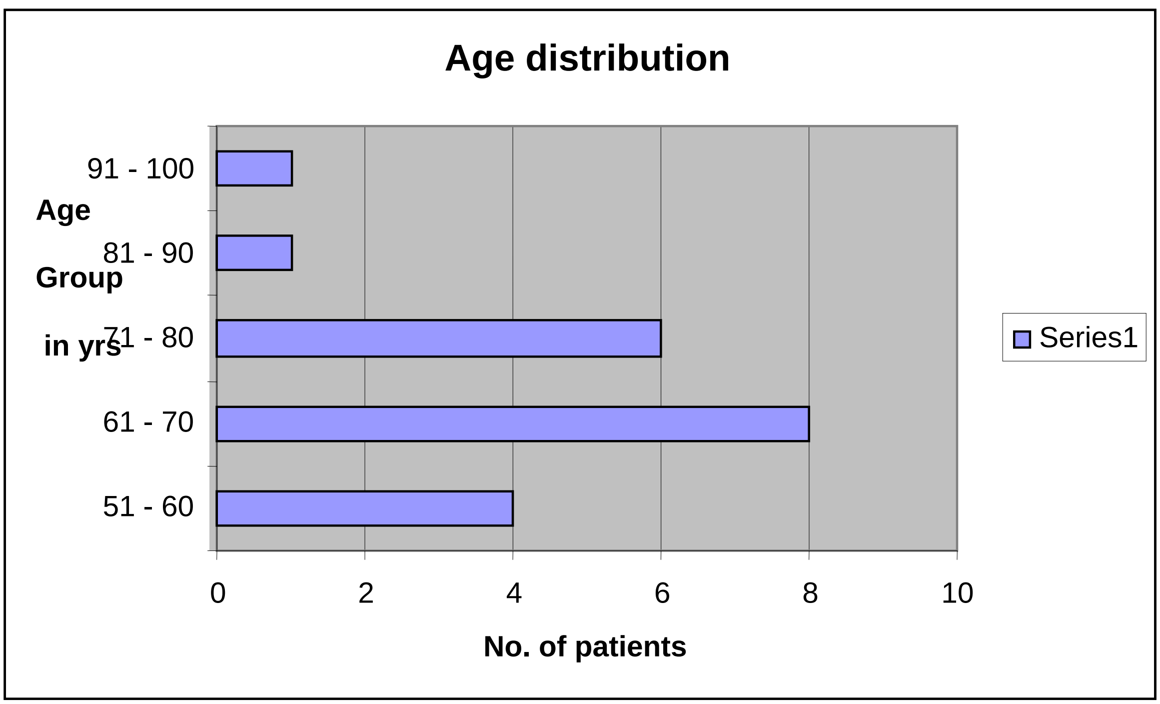
Sex distribution

Sex	**No. of Patients**
Male	9
Female	11

Age incidence

Age group	**No. of Patients**
51 – 60	4
61 -70	8
71 – 80	6
81 – 90	1
91 – 100	1


Sex distribution
45%
55%
Male
Female


Age distribution
Age Group in yrs
91 - 100
81 - 90
71 - 80
61 - 70
51 - 60
0
2
4
6
8
10
No. of patients
Series1

Side involved

Side	**No. of Patients**
Right	13
Left	7

Type of fracture

Boyd & Griffith classification	**No. of Patients**
Type III	12
Type IV	8

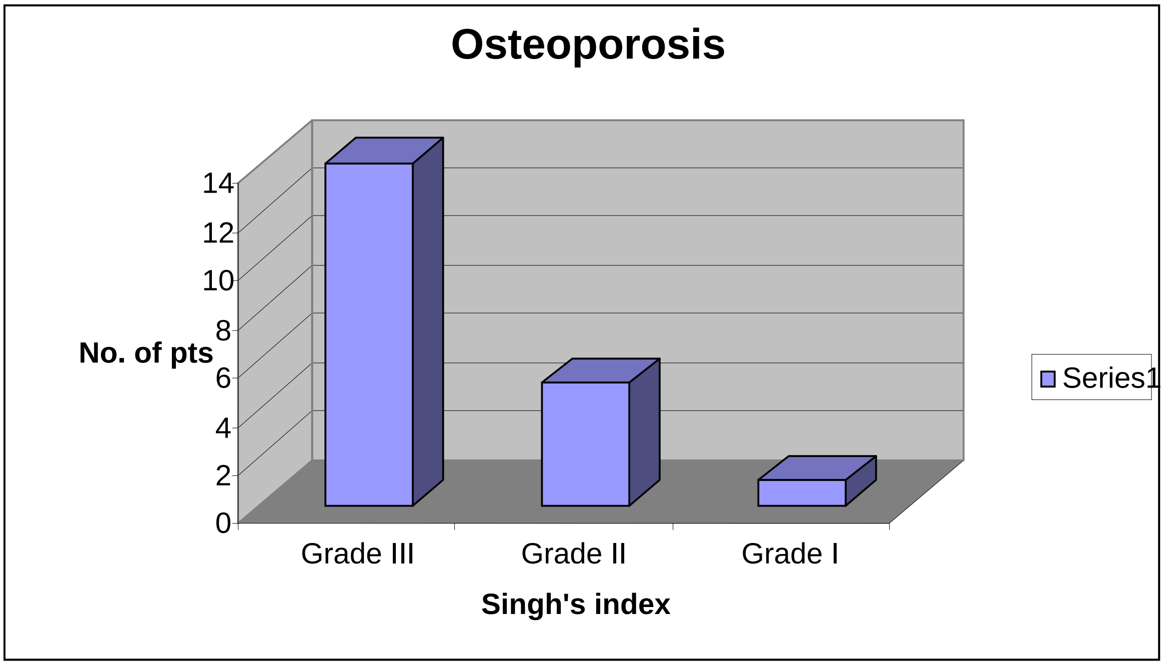
Preoperatively for the entire patients X ray pelvis with both hips AP and X ray of the involved hip AP view were taken. The grade of Osteoporosis was evaluated by Singh's index over the normal side.

Osteoporosis

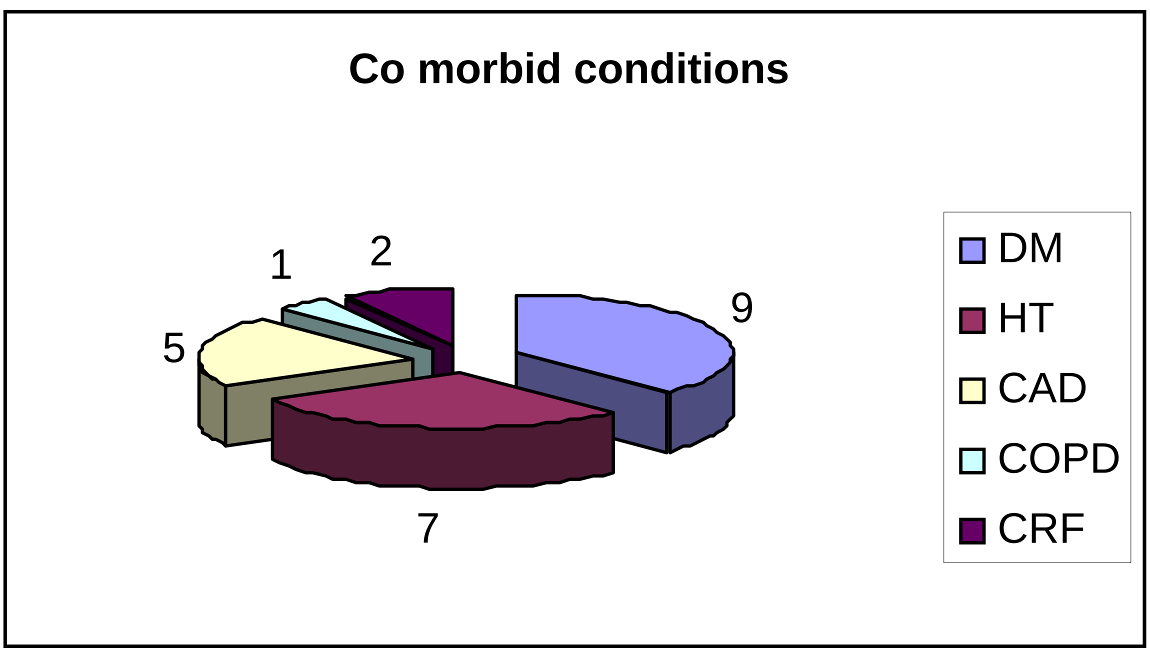
Singh's Index	No. of Patients
Grade III	14
Grade II	5
Grade I	1

Co morbid conditions

Co morbid conditions	No. of Patients
Diabetes Mellitus	**9**
Hypertention	**7**
Coronary Artery Disease	**5**
Chronic Obstructive Lung Disease	**1**
Chronic Renal Failure	**2**



Osteoporosis
No. of pts
14
12
10
8
6
4
2
0
Grade III
Grade II
Grade I
Singh's index
Series1



Co morbid conditions
1
2
5
9
7
DM
HT
CAD
COPD
CRF

Surgical Approach Used

Approach	**No. of Patients**
Lateral	16
Posterior	4

Implants

Prosthesis type	**No. of Patients**
Thomson	**16**
Bipolar	**4**

SURGICAL PROCEDURE

PREPARATION OF PATIENT

On the day of the surgery, the skin is prepared using povidone iodine solution and covered with sterile clothes and brought to the theatre where the final preparation is done. Prophylactic antibiotic is given on the table. A third generation cephalosporin is preferred in the dose of 1 gm given Intra Venously.

OPERATION THEATRE

Nowadays most hip arthroplasties are being done in theatres with laminar flow, using body exhaust systems to reduce exogenous bacterial contamination. Adequate precautions are taken to maintain asepsis such as thorough fumigation, air conditioning, limiting the flow of traffic through the theatre to essential personnel only and use of prophylactic antibiotic.

ANESTHESIA USED AND POSITIONING

Epidural or General anesthesia is usually employed. The patient is then positioned lateral or supine according to the approach used.

LATERAL APPROACH (Hardinge)

Place the patient supine with the greater trochanter at the edge of the table and the muscles of the buttocks freed from the edge. Make a posteriorly directed lazy-J incision centered over the greater trochanter. Divide the fascia lata in line with the skin incision and centered over the greater trochanter. Retract the tensor fasciae latae anterioly and the gluteus maximus posterioly exposing the origin of the vastus lateralis and the insertion of the gluteus medius. Incise the tendon of the gluteus medius obliquely across the greater trochanter leaving the posterior half still attached to the trochanter. Carry the incision proximally in line with the fibers of the gluteus medius at the junction of the middle and posterior thirds of the muscle. Distally, carry the incision anteriorly in line with the fibers of the vastus lateralis down to bone along the anterolateral surface of the femur. Elevate the tendinous insertions of the anterior portions of the gluteus minimus and vastus lateralis muscles. Abduction of the thigh then exposes the anterior capsule of the hip joint. Incise the capsule as desired. During closure, repair the tendon of the gluteus medius with nonabsorbable braided sutures.

POSTERIOR APPROACH (MOORE)

The patient is placed in the lateral position or semi prone on the unaffected side. The incision begins 10 cm distal to the posterior superior iliac spine, extends laterally to the greater trochanter and then distally along the lateral thigh. The fascia lata is divided over the greater trochanter and continued proximally and distally in the line of the skin incision. The fibers of gluteus maximus are separated by blunt dissection, the posterior flap containing almost the entire muscle. Retracting this posterior flap and with further blunt dissection the sciatic nerve is identifiable in the depths of the incision. Stay sutures are placed through the tendons of piriformis and obturator internus and the short external rotators are divided close to their trochanteric insertions. While retracted posteriorly they serve as a soft tissue protection for the sciatic nerve. The capsule is incised posteriorly along the femoral neck. The hip may be dislocated by flexion, adduction and internal rotation.

PROCEDURE:

Through the above said approach either posterior or lateral, the fracture site is exposed. With the fracture fragments temporarily reduced, the neck of the femur is cut approximately 1 cm above the lesser trochanter. If the fracture in the calcar fragment had extension beyond the lesser trochanter the fragment was stabilized partially using a cerclage wire or a bone reduction clamp when the femoral canal is reamed.

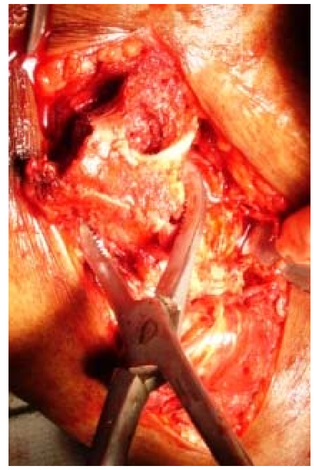
The femoral stem was cemented in place using standard modern cementing techniques that include, lavage, cleaning, drying and plugging of the canal. Before cementation, one or two cerclage wires were placed around the large calcar fragment which also includes the lesser trochanter. Then cementation was done. The femoral stem was impacted gently into position until there was good bony coaptation at the inter trochanteric fracture line. Extreme care was taken to keep the tip of the wire passer on bone at all times to avoid injury to the sciatic nerve. The fractured greater trochanter with the abductor mechanism was stabilized with the main fragment by using 18 gauge cerclage wire, in a figure of 8 fashion. The wound was closed in layers with a suction drain. The drain was removed at 48 hrs and the patient was made to walk with full weight bearing as tolerated, under the supervision of a physical therapy team.

Post operative protocol

Intra venous antibiotic prophylaxis was given routinely to all patients at the time of induction of anaesthesia and are continued for 48 hours and then switched on to oral antibiotics till suture removal. Drain was removed after 48 hours. All the patients were allowed to stand and walk after removal of drain depending upon the patients tolerance to pain. No restriction was imposed during post operative mobilization of patient. In our study no routine DVT prophylaxis was given.

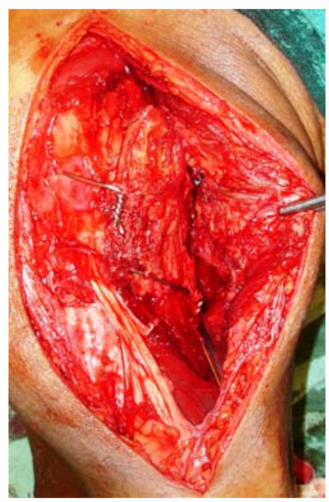
INTRA OPERATIVE PICTURE

Lateral approach



Temporary reduction

Prosthesis insertion



Greater trochanter reattachment

Follow up

In our study the minimum follow up was 4 months and the maximum follow up was 22 months with a mean follow up of 10.7 months.

Follow up period

No. of months	**No. of pts**
0 – 6	**3**
7 – 12	**10**
13 – 18	**2**
19 – 24	**2**

The patients were reviewed regularly at 1 month interval for 6 months and later every 6 months. At the end of this study the patients were called back for review. At every visit the patients were assessed clinically using the Harris Hip Score.

OBSERVATION

OBSERVATION

This study was conducted at Madras Medical College and Govt. General Hospital on 20 elderly osteoporotic patients with unstable inter trochanteric fractures from January 2004 to April 2006. All the patients were treated with cemented Thompson or Bipolar hemiprosthesis.

The following observations are made in this study:

1. There was a slight female (55%) preponderance.
2. In most of our patients right side (65%) was commonly affected.
3. The incidence of fracture was more common in the age group of 60yrs – 80yrs. This shows those elderly age groups were more susceptible.
4. In the distribution of fracture according to Boyd and Griffith Classification, type III (60%) was more common because most patients had low velocity injury.
5. In most of the patients the Singh's index was Grade III (70%).

6. In majority of our patients the common pre existing co morbid conditions are Diabetes Mellitus (45%), Hypertension (35%) and Coronary Artery Disease (25%).
7. The lateral approach (80%) was more commonly used in our patients.
8. The Thomson hemi prosthesis (80%) was most commonly used.

Complications

The following complications were noted in our study

Dislocation	2 patients
Superficial infection	1 patient
Periprosthetic fracture	1 patient
Shortening	2 patients

COMPLICATIONS

1. Mrs. B, 70/F

Post operative dislocation

After reduction

2. Mr. G, 70/M

Fracture greater trochanter
With dislocation

Post reduction and
trochanteric reattachment

3. Mrs. V, 78/F

Periprosthetic fracture on Dynamic Compression Plating

4. Mrs. M, 70/F

Shortening – prosthesis sinking

1. **Dislocation:**

Of the two patients with dislocation one had dislocation in the immediate post operative period for which closed reduction and immobilization in derotation boot was done for 3 weeks. This patient was then able to weight bear and walk normally. The other patient had a fall one month after surgery and sustained refracture of greater trochanter with dislocation, for which open reduction and trochanteric reattachment was done.

2. **Superficial infection:**

One patient had superficial infection which subsided with antibiotics. There were no deep infections.

3. **Periprosthetic fracture:**

One patient had Johansson's type I periprosthetic fracture due to fall one month after surgery. The patient was treated by open reduction and internal fixation with Broad Dynamic Compression Plating. The patient expired after 6 months from the initial injury and was excluded from the study.

4. **Shortening:**

Two patients had shortening of about two centimeter, due to sinking of the prosthesis. This was mainly due to severe osteoporosis. This can be prevented to some extent by reconstruction of the posteromedial fragments before reaming using cerclage wires or reduction clamp.

RESULTS

RESULTS

This study was conducted at Madras Medical College and Govt. General Hospital on 20 elderly osteoporotic patients with unstable inter trochanteric fractures from January 2004 to April 2006. In our study all the patients were evaluated clinically using Harris Hip Score at various follow up period.

HARRIS HIP SCORE

PAIN:
- None or ignores it (44)
- Slight, occasional, no compromise in activities (40)
- Mild pain, no effect on average activities, rarely moderate pain with unusual activity; may take aspirin (20)
- Marked pain, serious limitation of activities (10)
- Totally disabled, crippled, pain in bed, bed ridden (0)

LIMP
- None (11)
- Slight (8)
- Moderate (5)
- Severe (0)

SUPPORT
- None (11)
- Cane for long walks (7)
- Cane most of the time (5)
- One crutch (3)
- Two canes (2)
- Two crutches (0)
- Not able to walk (0)

DISTANCE WALKED
- Unlimited (11)
- Six blocks (8)
- Two or three blocks (5)
- Indoors only (2)
- Bed and chair (0)

STAIRS
- Normally without using a railing (4)
- Normally using a railing (2)
- In any manner (1)
- Unable to do stairs (0)

PUT ON SHOES AND SOCKS
- With ease (4)
- With difficulty (2)
- Unable (0)

SITTING:
- Comfortably in ordinary chair 1 hr (15)
- On a high chair for one – half hour (3)
- Unable to sit comfortable in any chair (0)

ENTER PUBLIC TRANSPORTATION
- Yes
- No

Flexion contracture (degrees)
Leg length discrepancy (degrees)
ABSENCE OF DEFORMITY (all yes = 4, less than 4 = 0)
- Less than 30* flexion contracture
- Less than 10* fixed adduction
- Less than 10* fixed internal rotation in extension
- Limb length discrepancy less than 3.2cm

RANGE OF MOTION(total degree then check range to obtain score)
- Flexion (140*)
- Abduction (140*)
- Adduction (40*)
- External rotation (40*)
- Internal rotation (40*)

RANGE OF MOTION SCALE
- 211* - 300* (5)
- 161* - 210* (4)
- 101* - 160* (3)
- 61* - 100* (2)
- 31* - 60* (1)
- 0* - 30* (0)

Range of motion score:
Total Harris Hip score:
Readmission to hospital: Yes/No
Date of readmission:
Implant removal date:

Based on the Harris Hip Score (HHS), the results were graded as excellent, good, fair and poor as follows:

Excellent : $\geq$ 90 points

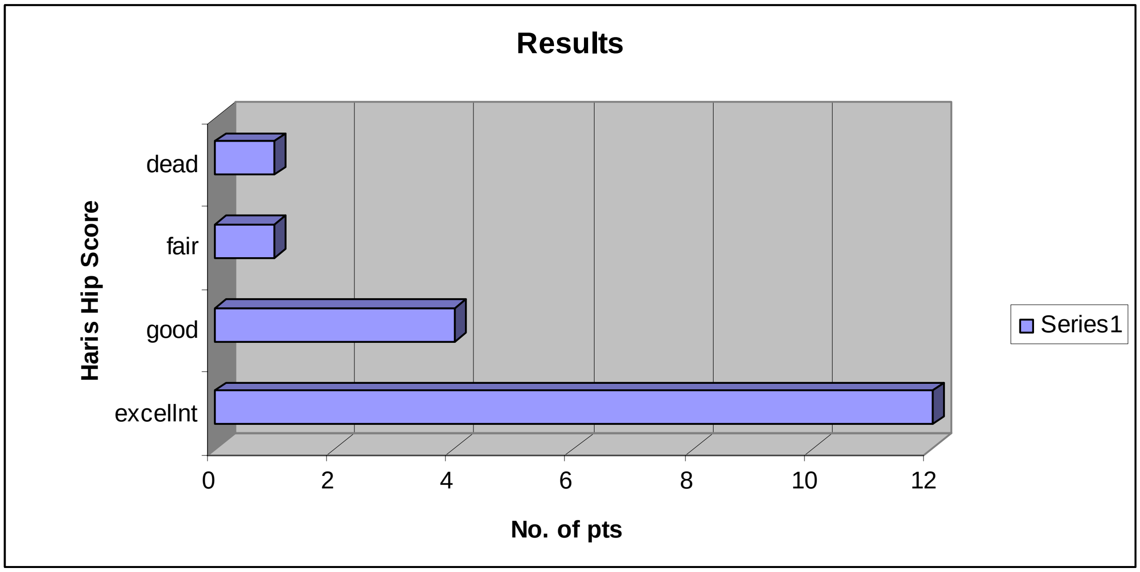
Good : 80-89 points

Fair : 70-79 points

Poor : <70 points

Based upon the above criterion the results of the study are as follows:

	No. of patients	Percentage
Excellent	12	66%
Good	4	22%
Fair	1	6%
Dead	1	6%



Results
dead
fair
good
excellnt
Haris Hip Score
0
2
4
6
8
10
12
No. of pts
Series1

ILLUSTRATIVE CASES

ILLUSTRATIVE CASES

CASE – 1:

Name – Mrs. Shajahan beevi

This 62 year old female had an accidental fall in her home and sustained type III Boyd & Griffin intertrochanteric fracture and was treated by cemented Thomson prosthesis.

Preoperative X – Ray

Post operative X - Ray

Patient at follow up

Standing

Flexion

Abduction

Adduction

External rotation

Internal rotation

CASE – 2:

Name – Mr. Panneerselvam

This 52 year old male had an RTA and sustained an type III intertrochanteric fracture and was treated by cemented bipolar prosthesis.

Preoperative X – Ray

Post operative X - Ray

Patient at follow up

Standing

Flexion

Abduction

Adduction

External rotation

Internal rotation

CASE – 3:

Name: Mr. Palani

This 70 year old male had an accidental fall in his home and sustained type IV Boyd & Griffin intertrochanteric fracture of the right hip and was treated by cemented Thomson prosthesis.

Preoperative X – Ray

Post operative X - Ray

Patient at follow up

Standing

Flexion

Abduction

Adduction

External rotation

Internal rotation

CASE – 4:

Name: Mr. Mukundan

This 85 year old male had an accidental fall in his home and sustained type IV Boyd & Griffin intertrochanteric fracture of the right hip and was treated by cemented Thomson prosthesis.

Preoperative X – Ray

Post operative X - Ray

Patient at follow up

Standing

Flexion

Abduction

Adduction

External rotation

Internal rotation

DISCUSSION

Discussion

Unstable intertrochanteric fractures consist of four components:

(1) The femoral head and neck fragment,

(2) The medial calcar - lesser trochanteric fragment,

(3) The posterior cortex-greater trochanteric fragment, and

(4) the femoral shaft.

These fractures are unstable because of loss of the structural support of the posterior and medial cortex, which allows the unsupported head and neck fragment to fall into varus, displace medially, and into a retroverted position.

Hip arthroplasty dramatically alleviates pain and improves function in the majority of these patients for whom other modalities of treatment have a high failure rate. Despite technical challenges associated with the performance of hip arthroplasty in these patients, there was a surprisingly low rate of serious orthopaedic complications.

Kenzora et al found on overall mortality rate of 15 percent in fractures about the hip compared to an expected mortality rate of 9 percent for the normal population. In his study, significant risk factors were identified. Patients over age 70 had three times the mortality of younger patients. Greater than three pre-existing medical conditions was associated with a 25 percent mortality rate, more than twice that of healthier patients. Surgery performed on the first day of admission and beyond the fifth day was associated with a 34 percent mortality rate. Those patients operated in during days 2 through 5 had a 5.8 percent mortality rate.

Laros et al and Moore et al showed that patients with bone quality of Singh's grade 3 or less had 33 percent complications, whereas those with Singh's grade 4 or better had 15 percent complications.

Sonstegard et al tested the stability of the cemented prosthesis-fracture complex and found it was significantly greater than any nail-reduction complex tested. They found that it was able to withstand a maximum load of about 1,007 kg, far in excess of loading forces encountered during normal ambulation.

Larsson et al & Regazzoni et al studies showed that excessive collapse, loss of fixation and cutting of the lag screw resulting in poor function are major problems associated with internal fixation of unstable intertrochanteric fractures in elderly patients with osteoporotic bone.

Harwin et al, Broos et al, Rodop et al reported that, to allow early post operative weight bearing and to avoid excessive collapse at the fracture site, primary prosthetic replacement is the method of choice for treatment of unstable intertrochanteric fractures.

Broos et al reporting on the treatment with bipolar vandeputte prosthesis found that the average operating time was shorter, the mortality rate was lower, and the functional results were better in the group treated with the bipolar hemiarthroplasty than in groups treated with Ender nailing, angled blade-plate, or a dynamic hip screw.

Harwin et al reported on osteoporotic elderly patients with comminuted intertrochanteric femoral fracture treated with bipolar Bateman-Leinbach prosthesis which were followed for an average of twenty-eight months. The average patient age was seventy-eight years, and 91% walked prior to discharge.

Rodop et al reported on patients who had been treated with a Bipolar Leinbach hemiprosthesis. A good to excellent result was obtained in 80% of the patients. There were no dislocations or cases of stem loosening.

Chang et al and Gill et al have reported on the use of cemented hemiarthroplasty in the elderly osteoporotic patients with unstable intertrochanteric fractures and concluded that the results of the arthroplasty equalled that of more conventional methods of fixation.

Haentgens et al reported that in patients treated with arthroplasty, rehabilitation was easier and faster and the incidence of pressure sores, pulmonary infection and atelectasis were significantly lower ($P<0.05$).The early walking with full weight bearing is considered to be the major contributory factor to these results.

Asencio et al, Evans et al & Stern et al stated that rapid return of the patients to the pre fracture level of activity has essentially prevented post operative complications such as pressure sores, pneumonia, atelectasis, pseudo arthrosis and any flare in co morbid conditions existing in these elderly patients.

From a review of literature we found that there was no single study in which all the parameters in our study could be compared, hence various similar studies are taken in to account for comparison.

In our study (MMC study) with short term analysis 55% were female which compares favorably with that of Stuart et al (75%) which shows definite female preponderance in whom there is an increased prevalence of osteoporosis. The mean age of our patients was 69 years which were lower than other studies Stuart et al (82.2 years), Chang et al (84.2 years). This may be due to the shorter life span for Indians when compared to the western population. In 65% of our patients right side was involved. This was in contrast to Mark B Stern et al (left – 58%).

In our study with short term analysis there were no failures related to inadequate stem length (or) mechanical loosening. The tendency to dislocation can be clinically identifiable by a major discrepancy in limb lengths. Some authors have recommended preservation and systematic closure of the capsule and reinsertion of the pelvitrochanteric muscles onto the vastus lateralis to prevent dislocation.Others has advocated systematic postoperative bracing and intensive muscular rehabilitation. We do not routinely use bed rest, balanced suspension, or a hip spica, since the postoperative dislocations in our series did not affect the long-term functional results. We allow early mobilization with immediate full weight-bearing, as in our opinion this is the major benefit and goal of the procedure. However in our study there were two post operative dislocations (10%).One patient in the immediate post operative period which was closely reduced and immobilized in a derotation boot for 3weeks after which the patient had a stable hip. The other patient had a fall after 1month with dislocation and greater trochanter fracture for which open reduction and trochanteric reattachment was done. The dislocation rates are comparable favorably with other studies (Stern et al & Goldstein et al -10%, Saragaglia et al - 14%).

There was no deep infection except one patient who had a superficial infection which was treated with antibiotics. Direct comparison of mortality rates is not feasible because of difficulty in matching critical factors such as age, gender, preinjury health status, social dependency and fracture type. The mortality rate in our patients was 5% which was less than Kenzora et al (15%) and chang et al(31.5%).

In our study 2 patients (10%) had shortening of about 2cm post operatively which was slightly better than that of James et al(11%). One patient with grade I osteoporosis had a fall post operatively after two months and sustained Johansson’s Type I periprosthetic fracture which was managed with open reduction and internal fixation with Broad Dynamic Compression Plating.

There were no other unusual medical (or) surgical complication seen in this series compared with other published reports on internal fixation and endoprosthetic replacement for intertrochanteric fractures.

In our study 95% of patients (19 of 20 patients who survived) retained walking ability after surgery. This compares favorably with other studies (82% chang et al, 76% laskin et al, 78% miller et al).

Potential long term problems associated with prosthetic replacement such as loosening, acetabular erosion, stem failure, late infection and late dislocation may yet occur and it needs a long term follow up.

CONCLUSION

In unstable intertrochanteric fractures of the elderly patient with osteoporosis, cemented hemiarthroplasty is one of the best choice. This study as is shown in other similar studies stresses that cemented hemiarthroplasty for unstable intertrochanteric fractures was better than those treated with other modalities like conservative, Jewett nail plate, Enders nail, Harris condylo cephalic nail, Gamma nail and DHS. The major advantage is early full weight bearing and rapid rehabilitation. It markedly reduces the problems associated with long periods of inactivity such as pneumonia, venous thrombosis, pulmonary embolism and decubiti ulcers. It also obviates the possibilities of nonunion, delayed union, mal union, nail (or) screw cut through, varus collapse etc.

It is also cost effective since it has fewer reoperations, decreased hospitalization, improved nursing care and improved function. Though the experience was short the results are encouraging.

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Proforma

Serial No :

Name : **Age/ Sex :**

Unit : Prof **IP No :**

DOA : **DOS :**

Address :

History :

Co morbid conditions :

Investigations :

1. **X Ray :**
2. **CT Scan :**
3. **Other Specific investigations :**
4. **Singh's index :**

Diagnosis :

Surgical details

Surgery :

D/B : Dr.

Anaesthesia :

Position :

Approach :

Size / Type of prosthesis :

Cementation : Yes / No

Post operative period :

Follow up :

SL. NO	Date	Harris Hip Score
1.		
2.		
3.		
4.		
5.		
6.		

s. no	*Name*	*Age*	*Sex*	*IP no.*	*Diagnosis B&G type*	*Side*	*Osteoporosis Grade*	*Approach*	*Procedure*	*complication*	*Follow up months*	*Results Harris Hip score*	*Comorbid condition*
1	**Mr Neelakandan**	**95**	**M**	**705221**	**IV**	**L**	**III**	**Post**	**CT-45**		**22**	**96 - excellent**	**HT,CAD**
2	**Mr Swaminathan**	**75**	**M**	**705231**	**III**	**L**	**III**	**Post**	**CT-45**		**19**	**87 - good**	**HT,DM**
3	**Mr Heralal**	**61**	**M**	**707223**	**IV**	**R**	**II**	**Lat**	**CT-43**		**Lost**		**DM, COPD**
4	**Mr Palanisamy**	**73**	**M**	**710414**	**III**	**L**	**II**	**Lat**	**CT-43**		**18**	**93 - excellent**	
5	**Mrs Valliammal**	**78**	**F**	**718144**	**III**	**R**	**I**	**Lat**	**CT-41**	**Shortening Peri prosthetic #**	**Expired**		**DM,HT, CAD**
6	**Mrs Sengothaiammal**	**71**	**F**	**718507**	**III**	**R**	**III**	**Post**	**CT-45**		**17**	**90 - excellent**	**DM,CRF**
7	**Mrs Muniammal**	**55**	**F**	**752654**	**III**	**R**	**III**	**Lat**	**CBP-43**		**12**	**87 – good**	**HT,CAD**
8	**Mrs Gowramma**	**55**	**F**	**759386**	**III**	**L**	**III**	**Lat**	**CT-43**		**11**	**94 - excellent**	**DM**
9	**Mrs Sarathammal**	**70**	**F**	**760181**	**III**	**L**	**III**	**Lat**	**CT-43**		**9**	**77 - fair**	
10	**Mr Bagya laxmi**	**71**	**F**	**767183**	**III**	**R**	**III**	**Lat**	**CT-41**	**Infection Dislocation**	**9**	**86 - good**	**DM,CAD**
11	**Mrs Emima**	**70**	**F**	**769949**	**IV**	**L**	**II**	**Lat**	**CT-43**		**9**	**93 – excellent**	**DM**
12	**Mrs Murugammal**	**70**	**F**	**770948**	**IV**	**R**	**III**	**Lat**	**CBP-43**		**9**	**94 – excellent**	**HT,CAD**
13	**Mrs Shahjahanbeevi**	**62**	**F**	**773688**	**III**	**L**	**III**	**Lat**	**CT-45**		**9**	**96 – excellent**	
14	**Mr Mukundan**	**85**	**M**	**773798**	**IV**	**L**	**II**	**Lat**	**CT-49**		**8**	**90 – excellent**	**HT**
15	**Mr Devan**	**55**	**M**	**775700**	**III**	**L**	**III**	**Lat**	**CT-43**	**Shortening**	**Lost**		
16	**Mrs Jainabee**	**65**	**F**	**778437**	**III**	**L**	**III**	**Lat**	**CBP-41**		**8**	**82 – good**	**HT,CAD**
17	**Mr Palani**	**70**	**M**	**779599**	**IV**	**R**	**III**	**Lat**	**CT-49**		**7**	**92 – excellent**	**DM**
18	**Mrs Parvathy**	**72**	**F**	**779364**	**III**	**L**	**II**	**Lat**	**CT-43**		**6**	**94 – excellent**	**DM**
19	**Mr Panneerselvam**	**52**	**M**	**787177**	**IV**	**L**	**III**	**Post**	**CBP-47**		**5**	**94 – excellent**	**CRF**
20	**Mr Govindan**	**70**	**M**	**786870**	**IV**	**L**	**III**	**Lat**	**CT-45**	**Dislocation**	**4**		